



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



HANAA ALY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم



شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



HANAA ALY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



HANAA ALY

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَيَسْأَلُونَكَ عَنِ الرُّوحِ قُلِ الرُّوحُ مِنْ أَمْرِ رَبِّي

وَمَا أُوتِيتُمْ مِنَ الْعِلْمِ إِلَّا قَلِيلًا

صَدَقَ اللَّهُ الْعَظِيمُ

سورة الإسراء (آية: ٨٥)



Effect of Neo Mineral Trioxide Aggregate and Hydroxyapatite Nanoparticulates on Odontogenic Differentiation and Proliferation of Human Dental Pulp Stem Cells

Thesis

*Submitted to the Faculty of Dentistry - Ain Shams University
for Partial Fulfillment of the Requirements for Master's Degree in
Endodontics*

By

Nehal Mohsen Mustafa Hussein Habib

B.D.S, Ain Shams University (2014)

**Faculty of Dentistry
Ain Shams University
2022**

SUPERVISORS

Prof. Dr. Abeer Abdelhakim Elgendy

Professor of Endodontics

Faculty of Dentistry

Ain Shams University

Dr. Tariq Yehia Abdelrahman

Lecturer of Endodontics

Faculty of Dentistry

Ain Shams University

Acknowledgement

*First and foremost, thanks to **ALLAH**, the most beneficent and merciful.*

*I would like to express my sincerest gratitude to **Prof. Dr. Abeer Abdelhakim Elgendy**, Professor of Endodontics, Faculty of Dentistry, Ain Shams University for her support, motivation, advice, much appreciated help, valuable remarks and meticulous revision throughout this work.*

*I would like also to thank **Dr. Tariq Yehia Abdelrahman**, Lecturer of Endodontics, Faculty of Dentistry, Ain Shams University for his continuous supervision, guidance, encouragement, and support.*

*I cannot express enough thanks for **Dr. Eman Fathy**, Lecturer of Oral Biology, Faculty of Dentistry, Ain Shams University who provided me with the experimental material and guidance. I really appreciate her knowledge and support.*

Nehal Mohsen Mustafa Hussein Habib

Dedication

All grateful words are not enough to express my feelings to:

My Beloved Parents,

*the reason of what I became today, who have been source
of inspiration and strength, whose affection, support and
prayers made me able to get such success and honor*

My Brother and Sisters

*who shared their words of advice and encouragement to
finish this study*

***Without their love and support this work would not have
been made possible.***

LIST OF CONTENTS

	<i>Page</i>
LIST OF TABLES.....	VI
LIST OF FIGURES.....	VII
LIST OF ABBREVIATIONS.....	IX
INTRODUCTION	1
REVIEW OF LITERATURE	3
AIM OF THE STUDY	28
MATERIALS & METHODS	29
RESULTS.....	48
DISCUSSION.....	57
SUMMARY & CONCLUSIONS.....	64
RECOMMENDATIONS	67
APPENDIX	68
REFERENCES	76
ARABIC SUMMARY	-

LIST OF TABLES

Table No.	Title	Page
1	Materials, instruments and devices used in the study	29
2	The list of elements	32
3	The mean, standard deviation (SD) values of Alkaline phosphatase assay of different groups.....	49
4	The mean, standard deviation (SD) values of H-score of different groups	50
5	Cell count by Trypan blue dye of human dental pulp stem cells (hDPSCs) for different groups	52
6	The mean, standard deviation (SD) values of hDPSCs count for different groups.....	53
7	The mean, standard deviation (SD) values of Cell proliferation assay (MTT) after 72 hours incubation of different groups	55
8	Dental pulp stem cell count at different concentrations of Nano Neo MTA.....	72
9	The mean, standard deviation (SD) values of cell count after 72 hrs incubation with different concentrations of Nano Neo MTA.....	74
10	The mean, standard deviation (SD) values of Cell proliferation assay (MTT) after 72 hours incubation with different concentrations of Nano Neo MTA	75

LIST OF FIGURES

Figure no.	Title	Page
1	Diagram illustrating the steps of Methodology	30
2	TEM images showing spherical like shape Neo MTA nanoparticles.....	32
3	Scanning electron microscope with energy-dispersive X-ray analysis (SEM-EDX) evaluating the chemical composition and the element distribution of NeoMTA nanoparticles.....	33
4	TEM images of NHAP needle like crystals	35
5	XRD spectra of hydroxyapatite nanoparticles.....	36
6	Photograph showing extracted molar immersed in PBS, antibiotics and preservative medium.....	37
7	Photograph showing pulp tissue fragments in petri dish containing PBS and antibiotics.....	39
8	Photograph showing cell pellet after pulp tissue digestion....	39
9	Microscopic image showing Trypan blue staining.....	45
10	Photograph showing well culture plates during MTT assay .	46
11	Characterization of hDPSCs cells using Multiparametric analysis	48
12	Bar chart representing alkaline phosphatase assay for different groups	49
13	Bar chart representing H-score for different groups	50

Figure no.	Title	Page
14	Immunofluorescence microscopic photomicrograph showing different groups.....	51
15	Bar chart representing count of hDPSCs cultured for different groups	54
16	Bar chart representing Cell proliferation assay (MTT) after 72 hours incubation for different group	56
17	Bell shaped graph illustrating the regression association between the log concentration of N. NeoMTA and the proliferation of hDPSCs	73
18	Bar chart representing cell count after 72 hrs incubation with different concentrations of Nano Neo MTA	74
19	Bar chart representing Cell proliferation assay (MTT) after 72 hours incubation with different concentrations of Nano Neo MTA	75

LIST OF ABBREVIATIONS

Abbreviation	Full term
AAE	American Association of Endodontists
ALP	Alkaline phosphatase
AMP	2-amino-2-methyl-1-propanol
DMEM	Dulbecco's Modified Eagle Medium
DMP	Dentin matrix protein
DMSO	Dimethyl sulfoxide
DPSCs	Dental pulp stem cells
ED	Enzymatic digestion
EDS	Energy dispersive spectroscopy
FBS	Fetal bovine serum
IF	Immunofluorescence
MTA	Mineral Trioxide Aggregate
MTT	3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide
NC	Negative control
NHAP	Nanohydroxyapatite
OM	Odontogenic medium
PBS	Phosphate buffered saline
PC	Positive control
pNPP	p- Nitrophenyl Phosphate
PSA	Penicillin G sodium, streptomycin and amphotericin B
RET	Regenerative endodontic treatment
SDS-HCL	Sulphur dodecyl sulphate-Hydrochloric acid
SEM	Scanning electron microscope
TEM	Transmission electron microscope
VPT	Vital pulp therapy
XRD	X-ray diffractometer

